CLAIMS

What is claimed is:

1. An assembly for measuring movement of and torque applied to a shaft, the shaft having first and second ends and being hollow, said assembly comprising:

a sensor mechanism positioned adjacent said shaft to detect a magnetic flux; and

a magnetic source having two magnetized poles disposed within said shaft for producing an essentially sinusoidal magnetic field distribution in both a radial and a circumferential direction around said shaft.

2. An assembly as set forth in claim 1 wherein said magnetic source is further defined as a magnet.

3. An assembly as set forth in claim 2 wherein said magnet is further defined as a permanent magnet.

4. An assembly as set forth in claim 1 wherein said sensor mechanism further includes a magnetostrictive material disposed annularly about said shaft and extending between first and second edges.

5. An assembly as set forth in claim 4 wherein said magnetostrictive material is applied directly to said shaft.

6. An assembly as set forth in claim 4 wherein said sensor mechanism further includes a flux collector extending beyond said first and second edges of said magnetostrictive material.

7. An assembly as set forth in claim 6 wherein said flux collector further includes a first half and a second half defining a gap therebetween.

8. An assembly as set forth in claim 7 wherein said sensor mechanism further includes a sensor disposed within said gap for measuring an axial component of the magnetic flux flowing from said edges of said magnetostrictive material.

9. An assembly as set forth in claim 8 wherein said flux collector is further defined as being attached to the shaft.

10. An assembly as set forth in claim 9 further including a pair of said flux collectors.

11. An assembly as set forth in claim 10 wherein said flux collectors are spaced 180 degrees from one another.

12. An assembly as set forth in claim 8 further including a pair of said flux collectors .

13. An assembly as set forth in claim 12 wherein said flux collectors are spaced 90 degrees from one another.

14. An assembly as set forth in claim 12 further including two pairs of said flux collectors.

15. An assembly as set forth in claim 14 wherein each of said flux collectors are spaced 90 degrees from one another.

16. An assembly as set forth in claim 8 wherein said sensor is further defined as a Hall effect sensor.

17. An assembly as set forth in claim 1 wherein said sensor mechanism further includes a positional ring extending annularly around and spaced from said shaft.

18. An assembly as set forth in claim 17 wherein said positional ring is formed of a magnetizable material.

19. An assembly as set forth in claim 17 wherein said sensor mechanism further includes a positional sensor disposed between said positional ring and said shaft for measuring a radial component of the magnetic flux produced by said magnetic source.

20. An assembly as set forth in claim 19 wherein said sensor mechanism further includes a pair of said positional sensors.

21. An assembly as set forth in claim 20 wherein said positional sensors are spaced 90 degrees from one another.

22. An assembly as set forth in claim 20 wherein said sensor mechanism further includes two pairs of positional sensors.

23. An assembly as set forth in claim 22 wherein each of said positional sensors are spaced 90 degrees from one another.

24. An assembly as set forth in claim 20 wherein said shaft is rotatable within said positional ring.

25. An assembly for measuring a magnetic flux, said assembly comprising:

a shaft having first and second ends and being hollow;

a magnetostrictive material disposed annularly about and directly on said shaft and extending between first and second edges;

a flux collector having a first half and a second half defining a gap therebetween and extending beyond said first and said second edges of said magnetostrictive material;

a sensor disposed within said gap for measuring an axial component of the magnetic flux flowing from said edges of said magnetostrictive material;

a positional ring extending annularly around and spaced from said shaft;

a positional sensor disposed between said positional ring and said shaft for measuring a radial component of the magnetic flux; and

a magnetic source disposed within said shaft for producing magnetic flux about said shaft.

26. An assembly as set forth in claim 25 wherein said magnetic source is further defined as a magnet.

27. An assembly as set forth in claim 26 wherein said magnet is further defined as a permanent magnet.

28. An assembly as set forth in claim 27 wherein said flux collector is further defined as being attached to said shaft.

29. An assembly as set forth in claim 28 further including a pair of said flux collectors.

30. An assembly as set forth in claim 29 wherein said flux collectors are spaced 180 degrees from one another.

31. An assembly as set forth in claim 27 further including a pair of said flux collectors.

32. An assembly as set forth in claim 31 wherein said flux collectors are spaced 90 degrees from one another.

33. An assembly as set forth in claim 32 further including two pairs of said flux collectors.

34. An assembly as set forth in claim 33 wherein each of said flux collectors are spaced 90 degrees from one another.

35. An assembly as set forth in claim 34 wherein said sensor is further defined as a Hall effect sensor.

36. An assembly as set forth in claim 25 wherein said positional ring is formed of a magnetizable material.

37. An assembly as set forth in claim 25 further including a pair of said positional sensors.

38. An assembly as set forth in claim 37 wherein said positional sensors are spaced 90 degrees from one another.

39. An assembly as set forth in claim 37 further including two pairs of positional sensors.

40. An assembly as set forth in claim 39 wherein each of said positional sensors are spaced 90 degrees from one another.

41. An assembly as set forth in claim 25 wherein said shaft is rotatable within said positional ring.

42. An assembly as set forth in claim 25 wherein said positional ring is positioned between said edges of said magnetostrictive material.

43. A method of measuring a magnetic flux flowing through and around a shaft having first and second ends and being hollow, said method comprising the steps of:

providing the shaft with a magnetostrictive material disposed annularly about and directly on the shaft and extending between first and second edges;

positioning a flux collector having a first half and a second half defining a gap therebetween and extending beyond the first and the second edges of the magnetostrictive material adjacent the magnetostrictive material;

disposing a sensor within the gap for measuring an axial component of the magnetic flux flowing from the edges of the magnetostrictive material positioning a positional ring annularly around and spaced from the shaft;

disposing a positional sensor between the positional ring and the shaft for measuring a radial component of the magnetic flux; and

disposing a magnetic source within the shaft for producing the magnetic flux for detection about the shaft.

44. A method as set forth in claim 43 further including the step of detecting an axial component of a magnetic flux through the flux collector with the sensor.

45. A method as set forth in claim 43 further including the step of detecting a radial component of the magnetic field through the positional ring with the positional sensors.

46. A method for measuring movement of a shaft having first and second ends and being hollow, said method comprising the steps of:

positioning a sensor mechanism adjacent the shaft to detect a magnetic flux;

disposing a magnetic source having two poles within the shaft for producing a parallel magnetic field emanating radially from said shaft; and

maintaining the magnetic source within the shaft to continuously induce a bi-directional magnetic flux through the shaft.

47. A method as set forth in claim 46 further including the step of detecting an axial component of a magnetic flux through the sensor mechanism.

48. A method as set forth in claim 46 further including the step of detecting a radial component of the magnetic field through the sensor mechanism.